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Abstract

Purpose: Despite insufficient laboratory data, radiotherapy after intratumoral injection of hydrogen peroxide (H_2O_2) is increasingly being used clinically for radioresistant tumors. Especially, this treatment might become an alternative definitive treatment for early and advanced breast cancer in patients who refuse any type of surgery. The purpose of this study was to investigate the biological effects and appropriate combination methods of irradiation and H_2O_2 *in vivo*.

Materials and Methods: SCCVII tumor cells transplanted into the legs of C3H/HeN mice were used. Chronological changes of intratumoral distribution of oxygen bubbles after injection of H_2O_2 were investigated using computed tomography. The effects of H_2O_2 alone and in combination with single or five-fraction irradiation were investigated using a growth delay assay. The optimal timing of H_2O_2 injection was investigated. Immunostaining of tumors was performed using the hypoxia marker pimonidazole.

Results: Oxygen bubbles decreased gradually and almost disappeared after 24 h. Administration of H_2O_2 produced 2–3 days' tumor growth delay. Tumor regrowth was slowed further when H_2O_2 was injected before irradiation. The group irradiated immediately after H_2O_2 injection showed the longest tumor growth delay. Dose-modifying factors were 1.7–2.0 when combined with single irradiation and 1.3–1.5 with fractionated irradiation. Pimonidazole staining was weaker in tumors injected with H_2O_2. H_2O_2 injection alone had modest antitumor effects. Greater tumor growth delays were demonstrated by combining irradiation and H_2O_2 injection.

Conclusions: The results of the present study could serve as a basis for evaluating results of various clinical studies on this treatment.